Professor Shull[8] observed more carefully, found that this was not the case, and concluded that the synchronism observed by Dolbear was an illusion. However, Shull observed certain cases in which two individuals were in synchronism. His observations are not open to the objections raised in case of the fireflies, because: first, there being only two crickets concerned, the statistical fallacy does not enter; secondly, his observations were repeated and checked with great care, the rate of chirping being accurately timed. There can be no doubt that Shull observed real synchronism between two crickets at a time. But he says (in a letter to me, dated October 8, 1916):

> I am at present inclined to think that these cases of synchronism were usually accidental. . . . However, the insects do, I am sure, influence one another. . . . I regard it as still an open question whether something more than chance was involved.

In the article quoted, he questions whether the synchronism may have been due merely to temperature; for at a given temperature nearly all the crickets chirp at almost exactly the same rate.

In answer to our question whether animals ever do maintain a synchronic rhythm of a sort not included under (1) and (2) of my fourth paragraph, we have found good evidence for an affirmative answer only in the case of crickets chirping. And in that case it is still somewhat in doubt whether their simultaneity is accidental, or due to the influence of environment, or due to a lock and key adaptation by which one cricket stimulates the other. If any naturalist can give complete and accurate observations on such synchronic rhythms, these will be of great interest to the psychologist.

Wallace Craig

University of Maine

Is Cucumber Mosaic Carried by Seed?

In 1915 cucumber mosaic caused a rather serious loss on one of the farms where cold frame cucumbers are grown in the tidewater section of Virginia. The same disease again developed on this farm in the spring of 1916 on land which was in cucumbers last year and also on land which had not grown this crop for the past three years. This year as usual the seed was sown in pots in the greenhouse and the plants were transplanted to the cold frames on April 5, 1916.

On May 25, 1916, before the glass covering had been removed from the cold frames, the writer observed typical mosaic plants scattered throughout the frames. A little later "white pickle" fruits were also obtained from the diseased vines. Of a total of 7,785 plants 110 were diseased on the above date.

The cold frame growers in this section all use one strain of forcing-cucumber seed which they obtain from the same seed company. On visiting the other cold frame farms during the same week typical cases of mosaic were found on three of the five farms and plants suspected of the disease were observed on the other two. Plants on one of the latter two farms have since produced typical "white pickle" fruits though the leaves are not strikingly mottled.

These observations indicated that the disease was carried by the seed, but as in some cases the diseased plants were growing on land which had produced mosaic plants the previous season, there remained the possibility of a soil factor.

Data which made the matter of soil transmission appear less likely was obtained from cucumber plants which the writer was growing at the Virginia Truck Experiment Station. These plants were from the same strain of seed as that used by all of the cold frame growers. The seed was planted April 27, 1916, in a cold frame of steam sterilized soil which had not previously grown a crop of cucumbers. Of a total of 155 plants 58 typical mosaic plants were observed on June 5, 1916. No insects were observed on the plants up to that time, probably due to the fact that the bed is surrounded on three sides by a tall hedge and on the fourth side by the station greenhouses. The high percentage of diseased plants and the failure to account for the disease in any other way lead the writer to think that this mosaic came from the seed.

[8] Shull, A. F., The Stridulation of the Snowy Tree-cricket (*Œcanthus niveus*), *Canadian Entomologist*, 1907, Vol. 39, 213–225.

Further confirmatory data relative to seed transmission has since been obtained from seed which the writer saved from typical "white pickle" cucumbers collected during the season of 1915. Unfortunately a large per cent. of the seed thus obtained was destroyed by mice. From the small amount which remained eleven typical mosaic plants have been obtained. These plants first showed mosaic in the second or third true leaves, and have since produced typical "white pickle" fruits. The plants were started in pots of steam sterilized soil and transplanted to a field which had not previously grown cucumbers. At the time the disease was first observed on these plants no cucurbits were growing nearby and no insects had been seen on the plants. It seems advisable to present these observations as indicating another means of primary dissemination of cucumber mosaic.

J. A. McCLINTOCK
VIRGINIA TRUCK EXPERIMENT STATION,
NORFOLK, VA.

THE CULTURE OF PRE-COLUMBIAN AMERICA

TO THE EDITOR OF SCIENCE: In common doubtless with many of your readers I noted with interest the short sketch by Professor Grafton Elliot Smith of his views regarding the migration of culture to the American continent. I also awaited with some expectation of assurance an unveiled hostility, which has now appeared in your columns of the issue of October 13, under the signature of Dr. Goldenweiser and Mr. Means.

From the nature of circumstances it must be some weeks before my former chief can reply to these gentlemen and I would request, therefore, in the meantime the opportunity to make a few suggestions.

Apart altogether from the confession of Dr. Goldenweiser, it is of course obvious from their arguments that both writers have arisen in opposition and committed themselves in your columns without having informed themselves of Professor Elliot Smith's precise statements and method of handling his mass of accumulated evidence.

From a somewhat misleading footnote in your issue of August 11 it would seem that "The Significance of the Geographical Distribution of the Practise of Mummification" had as yet to be published. This monograph appeared in the *Memoirs* of the Manchester Literary and Philosophic Society on July 7, 1915, and was published in book form under title "The Migrations of Culture" a few weeks later. But together with the succession of ensuing papers in that journal and in the *John Rylands Bulletin,* this important monograph seems entirely to have escaped the attention of your contributors. That this should be so in the maze of present-day literature is entirely forgivable, but it is amazing that in "awaiting with the greatest interest and impatience" further exposition of Elliot Smith's brilliant work, ethnologists should hasten with such unseemly speed to warn him against encroaching upon a theory which by the assertion of Dr. Goldenweiser himself must forever rest upon the uncertain basis of mere negative evidence, a theory which to some of us in the light of modern exactitude of method seems scarcely defensible.

Dr. Goldenweiser would have us prove every step of the way in the diffusion theory, and rightly so. In the chaos of ethnological observations, many of them afforded by amateur or untrained investigators, and by indifferent methods, too much stress can not be laid upon this. But at the same time are we really to accept for any particular custom the assertion of independent development merely because as yet rigorous proof of diffusion is not forthcoming! Professor Elliot Smith simply contends that we should subject both to the most searching investigation. Contrary to Dr. Goldenweiser's suggestion, it is not loosely claimed that sometime, somehow, diffusion has occurred. Such statements as have been made are accompanied by tangible evidence of their accuracy. The excellent and indisputable researches of Professor G. A. Reisner and Dr. Elliot Smith in Egyptian archeology afford a striking example of the care and vigor with which every shred of evidence is scrutinized. In the work of the two investigators just mentioned on the discovery of the use of copper and the evolution of the rock cut tomb and in